

Intel[®] Ethernet NVM Update Tool

Quick Usage Guide for Linux

Ethernet Networking Division (ND)

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Revision History

Revision	Date	Comments
1.3	November 19, 2018	Updates include the following: <ul style="list-style-type: none">• Updates for NVM version 6.80 for Intel® Ethernet Controller X710/XXV710/XL710.• Updated for NVM version 2.00 for Intel® Ethernet Controller X550.• Added Section 5.1, "Troubleshooting"• Added Section 5.2, "Recovery Mode"• Added Section 6.0, "Create/Edit <code>nvmupdate.cfg</code> for Custom NVM Images"
1.2	February 12, 2016	Updates for Software Release 5 for i40e and Linux.
1.1	March 31, 2015	Minor updates
1.0	March 4, 2015	Initial release (Intel Public).



1.0 Introduction

This document demonstrates how to update both the Non-Volatile Memory (NVM) and drivers on the Intel® Ethernet Controller X710/XXV710/XL710, the Intel® Ethernet Controller X550, and the Intel® Ethernet Converged Network Adapters using the Intel® Ethernet NVM Update Tool (NVM Update Tool). It is a guide to servicing NVM images, firmware, and drivers of the Intel® Ethernet Controller X710/XXV710/XL710 and Intel® Ethernet Controller X550 by customers and service technicians in the field.

Note: The information in this document is for experienced system administrators who are familiar with server, network, and data center concepts and technologies.

2.0 Update Both NVM and Driver at the Same Time

Keeping up with software changes, performance enhancements, or security updates requires the most current hardware drivers for supported systems. Previous updates to Intel network adapters were driver specific. With the Intel® X710/XXV710/XL710 10/25/40 GbE adapters and Intel® X550 10 GbE adapters, both the firmware (device NVM image) and network drivers are field-serviceable, allowing the NVM image and network driver to be updated as a matched set. Updating the device image and driver together can increase key features including performance, manageability, media types, physical port counts, virtualization, offloads, remote boot options, VLAN support, teaming, and Receive Side Scaling.

Note: Update to the most current i40e driver prior to running the NVM Update Tool to ensure the newest features of the NVM image can be installed.

The NVM Update Tool has a built-in integrity check that ensures only Intel-approved firmware updates on the Intel® X710/XXV710/XL710 and Intel® X550 devices. Integrity validation of NVM updates is provided by a digital signature. NVM updates are validated prior to invalidating the old NVM configuration, so the old NVM and the configuration are still usable should the update fail.

Note: Updating to the most current NVM (with the NVM Update Package) and driver does not update the Option ROM. Intel recommends an Option ROM update after the NVM and driver are updated. Refer to the [User Guides for Intel® Ethernet Adapters](#) page for the most current Option ROM update process version.

Note: When running SR-IOV, it is recommended that all Virtual Functions be disabled prior to the NVM Update process.

3.0 Obtaining New Images

The [Intel Download Center](#) (X710, XXV710, XL710, or X550) is Intel's repository for the latest software and drivers for Intel products. The NVM Update Packages for Windows, Linux, ESX, FreeBSD, and EFI/EFI2 are located at:

<http://downloadcenter.intel.com/download/24769>

Use the Software/NVM matrix tables in the [Intel® Ethernet Controller X710/XXV710/XL710 Feature Support Matrix](#) and the [Intel® Ethernet Controller X550 Feature Support Matrix](#) to ensure firmware image and driver compatibility. These documents are continuously maintained and always up-to-date.



4.0 Verifying Driver, Image Version, and Package Inventory

The open-source version of the NVM Update Tool requires a network driver on the system prior to the NVM update. It is recommended that the most current driver be installed on the system. Open-source network drivers can be downloaded from the Intel Download Center.

The first thing to check on the system receiving the update is the most current network driver and NVM image. This can be done with the **ethtool** interface command using the **-i** option, as follows.

```
ethtool -i ethX
```

Output of the **ethtool -i** shows the running version of the network driver, the firmware version, and ETrackID, as follows:

```
driver: i40e
version: 1.4.25
firmware-version: 4.42 0x8000191b 0.0.0
bus-info: 0000:01:00.0
supports-statistics: yes
supports-test: yes
supports-EEPROM-access: yes
supports-register-dump: yes
supports-priv-flags: yes
```

The last 4 hex characters in the firmware version denote the ETrackID.

In preparation for the firmware update, update the network driver to the most current version and identify the path to the NVM Update Tool on the target system.

5.0 Running the NVM Update Tool

To run `nvmupdate64e` command in terminal, you must be logged in as root. The NVM Update Tool runs from a Command-Line Interface (CLI). There are optional CLI attributes for specific tasks and are recommended for advanced users only. As CLI syntax, the NVM Update Tool can be scripted to run across large environments. An example of the update syntax is as follows:

```
nvmupdate64e - command syntax
nvmupdate64e -l fileoutput.txt - command with optional attribute
```

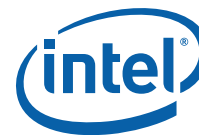
Note: For assistance with optional CLI attributes, contact your Intel Representative.

After extracting the tar file, navigate to the location of the NVM Update Tool executable to change the `nvmupdate64e` executable file permissions, as follows:

```
[root@localhost Linux_x64]# chmod 755 nvmupdate64e
[root@localhost Linux_x64]# ls -al | grep nvmupdate
-rwxr-xr-x. 1 admin 544 6385148 Nov 13 03:10 nvmupdate64e
-rwxr-xr-x. 1 admin admin 4100 Nov 13 15:49 nvmupdate.cfg
```

Run the tool like any Linux executable. An example of the Linux version of the NVM Update Tool update and its output is shown in [Figure 1](#).

Note: A typical update takes several minutes to complete.



```
[root@localhost Linux_x64]# ./nvmupdate64e

Intel(R) Ethernet NVM Update Tool
NVMUpdate version 1.26.17.09
Copyright (C) 2013 - 2015 Intel Corporation.

WARNING: To avoid damage to your device, do not stop the update or reboot or power off the
system during this update.
Inventory in progress. Please wait [*****1*+..]

Num Description                               Device-Id B:D   Adapter Status
=== =====
01) Intel(R) Ethernet Converged Network      8086-1572 01:00 Update available
    Adapter X710-4

Options: Adapter Index List (comma-separated), [A]ll, e[X]it
Enter selection: a
Would you like to back up the NVM images? [Y]es/[N]o: n
Update in progress. This operation may take several minutes.
[...*****]
Reboot is required to complete the update process.

Tool execution completed with the following status: All operations completed successfully.
Press any key to exit.
[root@localhost Linux_x64]#
```

Figure 1. Example Update and Output

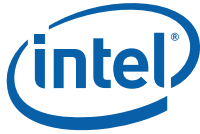
Note: The NVM update may require a two-step process depending on the initial image revision. Use the Software/NVM Compatibility table to verify the latest image versions.

When the flash image write completes, the tool asks for a reboot of the system to complete the update process and load the new firmware. After the reboot, verify the new firmware with **ethtool**, as follows:

```
driver: i40e
version: 1.4.25
firmware-version: 5.02 0x800020e1 0.0.0
bus-info: 0000:01:00.0
supports-statistics: yes
supports-test: yes
supports-EEPROM-access: yes
supports-register-dump: yes
supports-priv-flags: yes
```

Note: When updating from early NVM images, the NVM Update Tool may indicate that a power-cycle of the system is necessary. For Linux, we could use command "init 6" and "init 0" to reboot and powering down the system.

Note: The tool allows for updating one, multiple, or all of the installed adapters. For example, to update NVM firmware for two of thee installed adapters, follow the syntax as shown in the example below. Enter selection 02,03 (separated by a commas).



```
Num Description                               Ver. DevId S:B   Status
=====
01) Intel(R) Ethernet Converged Network      1.147  1563 00:004 Update not available
   Adapter X550-T2
02) Intel(R) Ethernet Network Adapter        5.81   158B 00:006 Update available
   XXV710-2
03) Intel(R) Ethernet Converged Network      5.05   1583 00:131 Update available
   Adapter XL710-Q2

Options: Adapter Index List (comma-separated), [A]ll, e[X]it
Enter selection:02,03
Would you like to back up the NVM images? [Y]es/[N]o: n
Update in progress. This operation may take several minutes.
[***+.....]
Reboot is required to complete the update process.

Tool execution completed with the following status: All operations completed successfully
Press any key to exit.
```

Figure 2. Example for Updating Multiple Adapters

Note: An NVM image downgrade process is available from Intel. Contact your Intel Representative for support of this process.

5.1 Troubleshooting

- Update to the most current base driver prior to running the NVM Update Tool to ensure the newest features of the NVM image can be installed.
- Refer to the “Software/NVM Compatibility” table in the following documents:
 - For Intel® Ethernet Controller X710/XL710/XXV710, refer to the *Intel® Ethernet Controller X710/XXV710/XL710 Feature Support Matrix* (Doc ID: 332191-xxx).
 - For Intel® Ethernet Controller XX550, refer to the *Intel® Ethernet Controller X550 Feature Support Matrix* (Doc ID: 335253-xxx).

This table indicates the set of NVM images and Intel Ethernet Controller software releases that go together. Intel recommends that you update the NVM and Software driver to compatible versions.

- Refer to the “NVM Transition Support” table in the following documents:
 - For Intel® Ethernet Controller X710/XL710/XXV710, refer to the *Intel® Ethernet Controller X710/XXV710/XL710 Feature Support Matrix* (Doc ID: 332191-xxx).
 - For Intel® Ethernet Controller XX550, refer to the *Intel® Ethernet Controller X550 Feature Support Matrix* (Doc ID: 335253-xxx).

This table indicates the version of NVM from which the NVM Update tool allows updates.

- In case of security issue, security revision may be incremented and then a NVM with lower security revision cannot be installed.
- The NVM version for X550 is NOT shown in the GUI. Only the EEtrack ID is displayed. If you run **nvmupdate** with **-i**, it should display.



5.1.1 Troubleshooting Using Debug Logs

1. Use the following command to get the log file if there is any error seen.

```
nvmupdate64e -l nvmupdate.log
```

This is a text file that contains history of the NVM Update tool's execution, including the success or failure status for each operation, and what adapters and ORMs were discovered. After running this command, the tool creates the *nvmupdate.log* file under the same folder as *nvmupdate.cfg*. The log file is overwritten each time the NVM Update tool is executed.

2. Use following command to get a little more information on what is in the system by using **nvmupdate** with an inventory mode.

```
nvmupdate64e -i -l inv.log
```

This provides more details about the adapters in the system to help narrow down the debug scope.

3. Use following command(s) to get a superset of debug logs.

First set following environment variables before **nvmupdate** execution. For debugging purposes, it is necessary to set these flags:

```
NUL_DEBUGLOG=1  
QV_DEBUG_LOG=0xFFFFFFFF
```

Now the log generated using the following command is much more detailed.

```
nvmupdate64e -l nvmupdate.lo
```

If you continue to have issues, contact Intel support with all these log files.

5.2 Recovery Mode

When using the NVM update tool, it is possible to get a status of "RECOVERY" or messages about Recovery Mode from the tool and/or Base Driver. If this occurs please refer to the *Recovery Mode in Intel® Ethernet Devices/Adapters Application Note* (Doc ID: 338102-001).

6.0 Create/Edit *nvmupdate.cfg* for Custom NVM Images

The goal of this section is to assist Intel Ethernet users to create/edit the *nvmupdate.cfg* file for their custom NVM images. For the Intel® Ethernet Controller XL710/X710/XXV710 and Intel® Ethernet Controller X550 families of products, this allows the use of NVM Update utility to update custom NVM images that are not included in the NVM Updated packages posted by Intel.



6.1 Sample Configuration File Template

The following is an example of a configuration file with one device block:

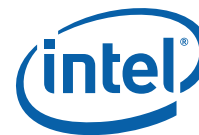
```
=====
CURRENT FAMILY: 12.1.1
CONFIG VERSION: 1.14.0

BEGIN DEVICE
DEVICENAME: Intel x540 Adapter
VENDOR: 8086
DEVICE: 10C9
SUBVENDOR: 8086
SUBDEVICE: A04C
REVISION: 2
PXE: 1.3.04
EFI: 2.7.06
ISCSI: 3.8.17
FCOE: 4.8.04
SMCLP: 5.8.17
NVM IMAGE: nvmImage.bin
OROM IMAGE: BootImg.flb
EEP SETTINGS: userSet.txt
EEPID: 800007A9
REPLACES: 80000692
EEPLAYOUT: 82599
RESET TYPE: POWER
END DEVICE
=====
```

6.2 Device Block in the Configuration File

A device block in configuration file lists out following information:

- CONFIG VERSION — Version of syntax for the configuration file.
- DEVICENAME — Device name currently in use. For example, Intel X550 Adapter, etc.
- VENDOR — PCI vendor ID 8086 identifies Intel as the manufacturer of the device.
- DEVICE — Device ID. Device IDs for supported retail Intel Ethernet Adapters can be found in here:
<https://www.intel.com/content/www/us/en/support/articles/000005612/network-and-i-o/ethernet-products.html>
- SUBVENDOR — Sub-vendor ID in hexadecimal format. This is optional when EEPID is used.
- SUBDEVICE — Sub-device ID in hexadecimal format. This is optional when EEPID is used.
- NVM IMAGE — NVM Image binary file name with which to update.
- OROM IMAGE — OROM Image file name.
- EEPID — ETrack ID of NVM Image with which to update.
- REPLACES — ETrack ID of NVM Image that with which to replace. Multiple ETrack IDs can be entered, separated by spaces.
- RESET TYPE — Specifies whether reboot/power cycle is required to complete the NVM update process.



6.3 Steps to Create/Edit *nvmupdate.cfg* File to Update Custom NVM Image

1. Include the custom NVM Image binary file under the same folder as the *nvmupdate.cfg* file and *nvmupdate64e* executable file.
2. Open the *nvmupdate.cfg* file as text file.
3. Copy and paste one of the device blocks (or use the example from above) and update following information for custom NVM image update.
 - a. Custom NVM Image binary file name in NVM IMAGE field.
 - b. ETrack ID (in the EEPROM field) of the custom NVM Image listed in NVM IMAGE field. This is the image that the device will be update to.
 - c. ETrack ID (in REPLACES field) of NVM Image that an update will be allowed from.

Note: When editing the *nvmupdate.cfg* file, you must ensure the ETrack ID in the *Replaces* field and the *EEPROM* field are the same type of image and are both created for the device that is being updated. For example, in X710/XXV710/XL710, a device with CFG_ID 2.4 should be updated with an image with CFG_ID 2.4.

- d. DEVICE, VENDOR, SUBDEVICE, SUBVENDOR must be set correctly to match the device required to update. SUBDEVICE, SUBVENDOR are optional when EEPROM is used.

OROM update can be skipped by including the line SKIP OROM: TRUE. Use **bootutil** to update the OROM if necessary. the remaining fields, including CURRENT FAMILY, CONFIG VERSION, DEVICENAME, RESET TYPE, can typically be left as is.

4. Run *nvmupdate64e* executable file.

Following is an example of Device block in the configuration file. This includes the minimum fields required for an update. The fields listed in **red** should be updated:

```
=====
CURRENT FAMILY: 12.1.1
CONFIG VERSION: 1.7.0

BEGIN DEVICE
DEVICENAME: Intel x540 Adapter
VENDOR: 8086
DEVICE: 10C9
NVM IMAGE: nvmImage.bin [Include the NVM Image File name to be updated with]
SKIP OROM: TRUE
EEPROM: 800007A9 [Mention ETrack ID of NVM Image that need to be updated with]
REPLACES: 80000692 [Looks for Etrack ID of NVM Image that need to be replaced,
Multiple Etrack IDs can be entered separated with space]

RESET TYPE: POWER
END DEVICE
=====
```



7.0 Summary

Updating the NVM and network driver can increase performance, manageability, and reliability of the Intel® X710/XXV710/XL710 and Intel® X550 Ethernet Converged Network Adapters. The update process has a built-in integrity feature to ensure that only Intel-approved firmware code is able to be updated after manufacturing. This procedure is performed each time an attempt is made to update one of the protected modules.

Intel Customer Support Services offers a broad selection of technical and customer support programs. For more information, contact your local Intel representative. Service and availability may vary by country.

For more information on the Intel® Ethernet X710/XXV710/XL710 adapter family go to the following links:

- <http://www.intel.com/content/www/us/en/network-adapters/converged-network-adapters/ethernet-x710.html>
- <http://www.intel.com/content/www/us/en/embedded/products/networking/ethernet-controller-xl710-family.html>
- <http://www.intel.com/content/dam/www/public/us/en/documents/product-briefs/ethernet-x710-brief.pdf>
- <http://www.intel.com/content/dam/www/public/us/en/documents/product-briefs/xl710-10-40-gbe-controller-brief.pdf>
- <https://www.intel.com/content/www/us/en/ethernet-products/network-adapters/ethernet-xxv710-brief.html>

For more information on the Intel® Ethernet X550 adapter family go to the following link:

- <https://www.intel.com/content/www/us/en/ethernet-products/converged-network-adapters/ethernet-x550-brief.html>



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